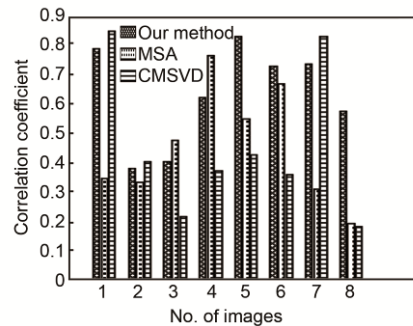


Multiband fusion image evaluation method based on correlation between subject and object evaluation

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Correlation coefficient between three comprehensive indexes and subjective evaluation.
Clarity of edge correlation coefficient.

Abstract: Image fusion is an important branch of multi-sensor information fusion, which is to synthesize several images or sequential detective images about one scene into a more complete and thorough image. At present, this technology has achieved a universal usage in remote sense detection, computer vision, target detection and recognition, etc. However, because of the variances of fusion image type, there is no standard evaluation method. Researchers have to select some appropriate evaluation indicators from a number of objective evaluation indicators by experience. The result is that different studies select different evaluation indicators, and it is hard to compare, which leads to lower persuasion in theory study. The hot issue on nowadays study is to choose relative evaluation indicators according to evaluation targets, and synthesize the chosen evaluation indicators to a comprehensive indicator. Indicator accuracy can be achieved through complementary advantages among indicators. An evaluation method of multiband fusion image is proposed based on the correlation of subjective and objective evaluations. This evaluation method includes the following steps. First, subjectively evaluate a variety of fusion results from four aspects. They are the clarity of edge, natural sense, information quantity and comprehensive evaluation. The evaluation level is divided into five levels: "good", "better", "normal", "poor" and "bad". Secondly, calculate the 14 objective evaluation indicators of the fusion results. Thirdly, normalize the subjective and objective evaluation results. Fourthly, use relative Spearman coefficient to calculate the correlation among each evaluation aspect and the 14 objective evaluation indicators. Fifthly, use the correlation to calculate the occupation weight of each objective evaluation indicator in the comprehensive evaluation indicator. Finally, construct a comprehensive index based on the correlation of the 14 indexes for every objective evaluation.

The experimental results show that the synthesis indicator based on correlation between subject and object evaluation is more relevant to the objective evaluations than the individual evaluation indicator, CMSVD (complex matrix singular value decomposition) and MSA (multi-hierarchical synthesis analysis). The correlation of clarity of edge, natural sense, information quantity and comprehensive evaluation are 0.634, 0.630, 0.737, and 0.661, respectively. As for different evaluation aspects, the correlations between the objective evaluation and subjective evaluation are different. However, the correlations of AG (average gradient), SF (spatial frequency) and VIFF (visual information fidelity for fusion) are relatively higher than other aspects.

Keywords: image fusion; subjective evaluation; objective evaluation; Spearman correlation coefficient; comprehensive index

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